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Spin kinetics and EPR in superconductors

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Abstract

The theory of the electron paramagnetic resonance (EPR) on magnetic impurities in type-II superconductors is presented. The kinetic equations describing the coupled motion of the magnetisation of localised spins and that of conduction electrons' spins are derived and solved. Analytical expressions for the relaxation rates, being the real parts of kinetic coefficients entering the equations, are obtained. These expressions are valid at arbitrary temperatures and frequencies of resonance within the approximation of the homogeneous superconductor. The detailed numerical analysis, allowing the authors to plot the temperature dependence of the EPR linewidth, is carried out. It is shown that the 'electronic bottleneck effect' becomes stronger in the superconducting state and, as a result, the linewidth becomes a monotonic function of temperature. The EPR experiments on superconducting systems are discussed.

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